Citizen Science Projects (MOOC) 3.10

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3.10 Types of visualisation and visual biases

##What kind of visualisation is best?

Choosing the kind of visualisation that is “best”, or most suitable, depends on the type of data you want to illustrate, which aspects of the data or results you want to highlight, your overall “message” and which audience you want to address. Also, you may ask yourself what kind of decisions a visualisation can inform. Often, this will lead to combinations of different types of visualisations. One example is the interactive [GROW soil moisture map](http://soilmoisturemaps.growobservatory.org), which uses citizen science data from low-cost soil sensors.

The map above aims to help farmers, scientists and policymakers interrogate spatial patterns of soil moisture and apply this to agriculture, levels of irrigation, and climate forecasting. The first version is a demonstration of the type of service that could be produced for any farmer who collects point data from sensors placed on their land in a grid format. Soil moisture is always changing and needs to be mapped over time to respond to the needs of crops.

The maps are designed to help farmers to answer questions such as:

+ How varying is my land?
+ Are there drier and wetter areas?
+ Which areas can keep more water for a longer period?
+ Where should I plant varieties with low or high water requirements?
+ Where do I need to plant varieties tolerant to water saturation?
+ How large is the area within my land that needs to be watered?

The map consists of:

+ A base map with a background satellite image of the terrain with the delineated area where sensors are placed, with every sensor marked individually.
+ A 3D “moisture model”, that displays in a large circle the moisture values between sensors on a site with colour saturation (the more saturated, the more moisture) and height (the higher, the more moisture). The values used for the interpolation model are single soil moisture values from one point in time per week (e.g., every Friday at 2 pm). So, the visualisation offers one moisture model per week.
+ Spatially represented single values for moisture, light and temperature, displayed in smaller circles as bars (the higher, the more moisture), and colour (the more saturated, the more

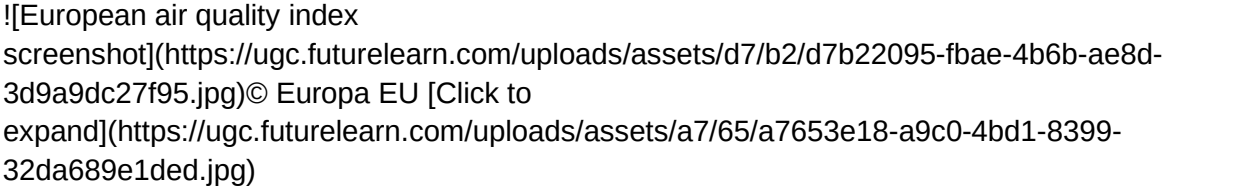
moisture). The values used are average daily data for each sensor for moisture, light and temperature.
+ Graphs for moisture, light and temperature, combining all sensor values in one graph over time, using average daily values.

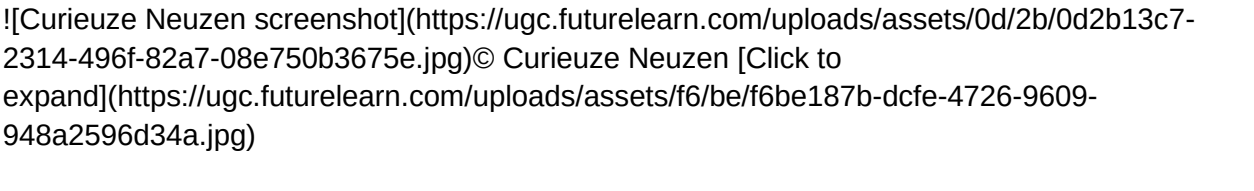
The map is interactive. It allows the user to scroll along a timeline and animate change in the moisture model and the moisture/light/temperature single values over time. Sensors can be selected from the base map to highlight individual values in the time-series graphs. The map can also be rotated and viewed from different angles, so a user can more easily explore their landscape. Text labels describe each element of the visualisation.

##Visual biases

Visualisations can convey strong visual messages. Using images, shapes and colours, they shape our imaginations. This also means that they are not free of bias. It is important to view them critically and to consider all the additional information you have, such as guiding principles or underlying assumptions that the visualisations are based on including colour codes and legends.

Let’s take a look at the following examples. Both are air quality maps from the city of Antwerp. The EPA map is a near real-time map from the European Environment Agency showing air quality in hourly intervals, using an indicator composed of five air pollutants. The other is a map from a large citizen science project in Belgium (Curieuze Neuzen), showing the average monthly NO2 value for May 2018.





Note that the current exposure limit for NO2 for the average annual concentration in the EU is 40 µg/m3.

##Compare the maps

Look at how the colours are used in both maps and compare them.

+ What insights about potential visual bias can you get?

+ Which colour scheme is closer to your understanding of showing an exposure limit?
+ What could motivate the difference in colours used?

Please share your thoughts in the discussion area below.